

Perfectly Impedance-Matched Negative Index High Temperature Selective Emission Films for Thermophotovoltaics, Phase I

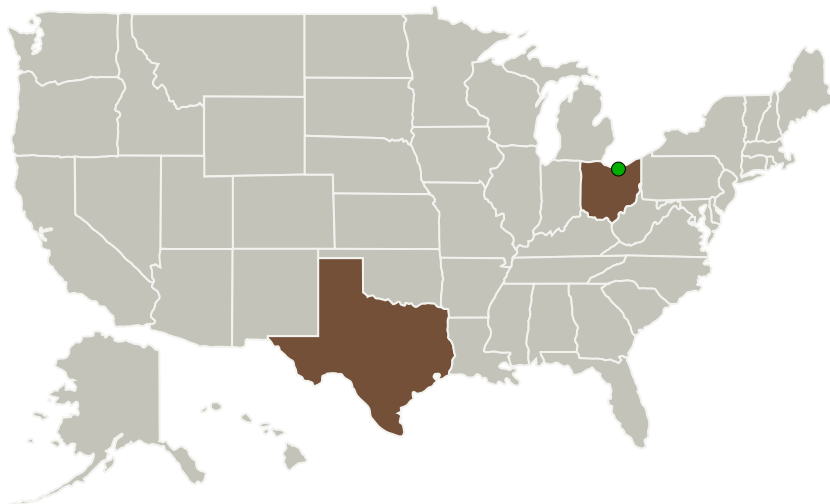
Completed Technology Project (2010 - 2010)



Project Introduction

Thermophotovoltaic (TPV) energy conversion produces electrical power from heat energy in a simple, low maintenance manner ideal for certain NASA applications. Currently, thermophotovoltaics suffer from low efficiencies, where only a small fraction of the total thermal energy is converted to electrical energy. One key to improving efficiency is to match the emitter spectrum more precisely to the conversion characteristics, using engineered metamaterial emitters. Metamaterials have shown great promise as efficient narrow-band selective emitters that can provide the improved spectral match between emitter and converter. To address the opportunity afforded by a novel metamaterials-based TPV emitter film, Nanohmics Inc. and Dr. Gennady Shvets at The University of Texas at Austin propose to develop the TALoNTM Emitter, a high-temperature, ultra-thin thermal emitter of infrared radiation for TPVs. Despite its simplicity and amenability to straightforward fabrication, our design encompasses all the advantages mentioned above: extremely highly selective emission, tunability of emission frequency, sub-wavelength size, and large field enhancement inside the metamaterial. Films will be constructed using the highly scalable process of "roll-to-roll" deposition and nanoimprint lithography using highly thermally stable materials such as tungsten and aluminum nitride.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Nanohmics, Inc.	Lead Organization	Industry	Austin, Texas
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Texas

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139325>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nanohmics, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

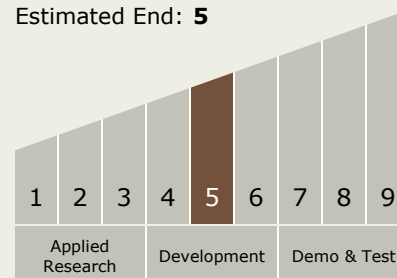
Principal Investigator:

Andrew Milder

Technology Maturity (TRL)

Current: **5**

Estimated End: **5**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.1 Power Generation and Energy Conversion
 - └ TX03.1.3 Static Energy Conversion

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System